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ABSTRACT Studies on demand side mechanisms related to experience goods argue that demand is driven by recommendation and reputation. In an auditing context, research showed that both of these mechanisms play an important role in determining partner selection, however, only when the mechanisms are observed in isolation. On this basis, this study raises a concern about whether the mechanisms are mutually exclusive, and if not, how does recommendation and reputation in auditor selection context create an interplay in the process of auditor selection. We test our hypotheses on network data of Danish public companies. Findings from the social network study indicate that auditor selection is a sensitive and complex task for boards of directors, as it is not only driven by either of the mechanisms. Rather, partner selection is driven by the combination of both recommendation and reputation, which creates the interplay and, thus, indicates that the demand mechanisms are not mutually exclusive and should not be observed in isolation of one another.

Keywords: Auditors; Interlocking directorships; Social network analysis; Recommendation; Reputation

JEL codes: M41; M42

1. Introduction

This study addresses the following research question: *How does recommendation and reputation, as two demand mechanisms, create an interplay in the auditor selection process?* The purpose of this paper is to identify whether, and how, the co-existence of recommendation and reputation-based demand side mechanisms in corporate governance system influences audit partner selection. The research question aims at challenging earlier theoretical assumptions on demand side mechanisms that assist buyers in differentiating experience goods (Davis & Robbins, 2004; Granovetter, 1973; Nelson, 1970; Podolny, 2001; Powell, 1990; Saxton, 1997), in which the previous studies argued that demand preferences are driven by either one of the two mechanisms (Beattie & Fearnley, 1998; Magri & Baldacchino, 2004; Woo & Koh, 2001; Neveling, 2006; Kacanski, 2017; Johansen & Pettersson, 2013). Arguably, taking into account such a perspective, the studies disregarded reflections on the potential synergetic effect of the two epistemologically detached theoretical standpoints on auditor choices.

Previous studies expressed significant interest toward pursuing the research on understanding and discussing consequences that corporate auditor choice or switch of auditor have for companies' businesses (e.g. Beattie & Fearnley, 1998; Magri & Baldacchino, 2004; Woo & Koh, 2001; Chang et al., 2019). Researchers' concerns were primarily focused on the aftereffects of the selection processes, in which the results were streamlined toward identification of auditor choice impacts on companies' financial position, value of assets, market share volatility, and company's reputation (Beattie & Fearnley, 1998; Magri & Baldacchino, 2004; Woo & Koh, 2001; Neveling, 2006). By

repositioning the discussion from the aftereffects of selection to the actual selection, this paper pursues further investigation of the underlying mechanisms that actually determine the auditor selection processes (Davis & Robbins, 2004; Granovetter, 1973; Nelson, 1970; Podolny, 2001; Powell, 1990; Saxton, 1997).

Prior research on auditor choices and auditor switch was polarized around the two theoretical assumptions, as studies primarily followed the argument that demand side mechanisms that assist buyers in differentiating experience goods are either driven by *recommendation* or *reputation* (Davis & Robbins, 2004; Granovetter, 1973; Nelson, 1970; Podolny, 2001; Powell, 1990; Saxton, 1997). However, such a duality of standpoints has only been implicitly addressed in the literature, as researchers considered either mechanism merely as a precondition to the development of theoretical argumentations. As a result, the exclusiveness of the operationalization of the either of them from empirical observations led toward dissemination of relevant but, at the same time, potentially conflicting results (Beattie & Fearnley, 1998; Magri & Baldacchino, 2004; Woo & Koh, 2001; Neveling, 2006; Kacanski, 2017; Johansen & Pettersson, 2013). In particular, different studies revealed that within the same research context both of the mechanisms have significant influence on general propensity of auditor selection, but under the implicit assumption that the effects of the alternative mechanism are not present in the same model of observation (e.g. Kacanski, 2017; Johansen & Pettersson, 2013). Consequently, such a misalignment between theoretical assumptions on potential mutual exclusiveness and the presence of the significances of both of them, raises the dilemma of whether those mechanisms, in fact, are mutually exclusive, or they are potentially interdependent (Lusher et al., 2013). On the contrary, the concern is primarily of whether, within the mutual observation, either one is actually more prevalent than the another, or they jointly construct the platform based on which the auditor selection process unfolds.

At the theoretical level, we mobilize the literature on cross-board relations as a mechanism of diffusion of corporate decisions (e.g. Davis & Greve, 1997; Larcker et al., 2005; Ortiz-de-Mandojana et al., 2012; Johansen & Pettersson, 2013), and reputation driven incentives for social selection (Saito and Takeda, 2014; Kacanski, 2017) to develop hypotheses. Following the literature and conditioning the argument on the assumption of the existence of interdependency (Lusher et al., 2013), we assert that, it is, in fact, possible to argue that both mechanisms could potentially be taken into consideration by corporate boards during the process of auditor selection. While assuming that the nature of selection is relational and that the asymmetrical information might co-exist in a buyer-seller relationship (OECD, 2009), we measure the significances of the effects of both mechanisms with the presence of variables pertaining to both theoretical standpoints.

Our sample includes information on supervisory board members (non-executive directors) and their audit partner choices that are collected for all publicly listed companies in Denmark in the period 2010-2014. We use Danish data because partner-level data are available, but also because there is a long tradition of strong relations between members of supervisory boards and external auditors, both legally and in practice. Also, the network of interlocking directors in Denmark is extensive, meaning that each board, on average, has 1.2 interlocking directors (Kacanski et al., 2017). On this basis, we assume that it is, in fact, possible to expect that individuals representing multiple boards play an important role in auditor choice at all the boards they represent. To test the hypotheses, we conduct network study by using exponential random graph models – ERGMs (e.g. Wang et al., 2013; Lusher, 2013) to account on interdependency (Robins, 2015) between the mechanisms.

The results of the study demonstrate that both demand mechanisms are positive and significant, considering the fulfillment of the condition of interdependency. This implies that cross-board knowledge sharing and reputation have equally important impacts on boards' decisions. Accordingly, the findings suggest that reputation and recommendation together characterize the audit partner selection network.

This study makes several contributions. First, our study contributes to the existing research, by extending our understanding of demand side mechanisms that assist buyers in differentiating goods as factors influencing the social process in auditor selection context. Earlier studies, while observing the mechanisms in isolation, treated individuals as an aggregation of individuals (Abbott, 1997:1152; White et al., 1976, Lusher et al., 2013) instead of considering them as self-contained social actors. By recombining the initially given theoretical distinction in the same study, and by accounting on their joint presence, we are able to provide more precise understanding of the role that those mechanisms collectively play on auditor choice. To the best of our knowledge, there are only two studies that, in auditor selection context, have observed recommendation and reputation mechanisms from network perspective (Johansen & Pettersson, 2013; Kacanski, 2017) as mutually exclusive processes. By identifying this, we argue that the process of corporate decision making on auditor engagement is a result of a combination of personal preferences based on experiences and recommendations given by the others, rather than merely the result of one of these mechanisms.

Second, we add to the research on determinants of social networks as a central component of auditor selection mechanisms to generate new knowledge by recombining the existing knowledge (Kacanski, 2017; Johansen & Pettersson, 2013). The application of social network analysis methodology, particularly exponential random graph models (Wang et al., 2013), enables us to gain insights into the underlying processes that create and sustain the network-based social system. ERGMs, as tie-based models, enable a comprehension of how and why social networks arise. Particularly, they permit integration of multiple theoretical assumptions (Monge and Contractor, 2003) while maintaining the premise of individuality of individuals in networks (Lusher et al., 2013). Therefore, in this study we assume that individuals are de-categorized actors who, as intentional beings, might have multiple motivations and multiple expressions of social action (Lusher and Robins, 2013). Consequently, following earlier research, in this study we assume that segregations confined the potential for expanding theoretical discussions toward understanding of the interplay, and we aim to address this gap in the study.

Third, our study is important for both audit practitioners and members of corporate boards. Particularly, audit practitioners (partners) may benefit from this study as they should take into consideration that tenures and engagement of new clients are both influenced by their own position in the audit partner network, but also the assemblage of boards of directors. Also, it is important for partners to acknowledge that directors who interlock have equally important function in the process of auditor selection, as much as that function could be given to the importance of reputation of audit partner as an individual node in audit partner network for the focal clients. Finally, corporate board members may also benefit from the outcome of this research by recognizing that decision-making processes are rather prone to a combination of both self-driven perceptions and social influences instead of being driven solely by either of these.

The paper is divided into five sections. Following this introduction, Section 2 reviews existing literature on recommendation and reputation-driven auditor selection. Section 3 provides information on the particular Danish context, describes data collection process and outlines the research method. Section 4 presents findings related to the impacts that the two demand-side mechanisms have on companies in relation to the auditor selection. Section 5 discusses the findings with the particular emphasis on the interplay between the mechanisms in the process of a determination of auditor selection decisions. This section ends with concluding remarks.

2. Theoretical Background and Hypotheses

2.1. Social Influence and Social Selection Processes – A Network Perspective

Social networks consist of individuals and the relational ties they establish with others in their proximity. Ties may carry various types of information, such as friendship, collaboration, etc., where the network itself is characterized by the dyadic social linkages (Robins et al., 2001). It is in the nature of social actors to form ties with some, but not all the actors that are present in the same network (Robins et al., 2001). This is because of the subjective nature of individuals' judgments (e.g. motivations, incentives, reasons) involved in making decisions about who to establish ties with (Lusher and Robins, 2013). As a consequence, the reality of social network emergence, which presupposes the de-categorization of individuals, appears to be more complex, as the individuals are considered as *a priori* decategorized actors who are individualized in their social presence (Lusher and Robins, 2013).

The social network theory distinguishes between the two types of social processes, which may be used to understanding the mechanisms by which networks unfold. The distinction is made according to a criterion of which driver led to the emergence of ties. Drivers could be either the relational ties themselves, or attributes held by social actors in the network (Robins et al., 2001). Firstly, in *social influence processes*, an existing network structure (i.e. presence or absence of ties) can affect tie emergence, as the individuals may be influenced by the others, with whom they have established ties (Robins et al., 2001; Lusher and Robins, 2013; Lusher et al., 2013; Wang et al., 2013, 2016). Secondly, when individuals' attributes drive the formation or change of network ties, it is referred to *social selection processes*.

Social influence, also called *network diffusion* or *network contagion*, is fundamentally concerned with the ways in which individuals affect the behaviour of the others they are connected with (Mason et al., 2007). According to Mason et al. (2007), ties between two social actors may cause assimilation and conformity between the two, as the behavior of one actor might influence the behavior of the other. This implies that two individuals who share the same tie are more likely to form ties with the same others, than what would be probable in the absence of that tie. For those purposes, network methods may be used to predict individual outcomes given the network structure, for instance, when individual's responses are assumed to relate to the responses of network patterns (Friedkin, 2006; Mason et al., 2007).

In social selection, when the structure of ties in networks is the research issue, network structure may be self-organized into various patterns, in which the tie formation, or dissolution, is driven by individuals' attributes (Robins et al., 2001). In contrast with social influence, social selection is mainly concerned with the role that the actors' characteristics take on those combined actor/tie locales. In this perspective, attributes are used to explain social ties. According to this mechanism, individuals are more likely to form ties with those who embody a specific attribute, than with those to who are missing that attribute.

Although Erickson (1988) asserted that, for research purposes, it may be more profitable to simplify the theoretical and analytical tasks by ignoring one process while examining the other, another group of researchers argued that these two processes are not mutually exclusive, but rather, are, intertwined (e.g. Leenders, 1997). In social network theory, social influence is operationalized through network *endogenous* patterns, while social selection considers attributes as *exogenous* predictors of network structure (Lusher et al., 2013). According to Lusher et al. (2013), parametric analysis of social processes should, in fact, include both. This should be done in a manner that, when exogenous predictors are research issue, then endogenous patterns should have the function of a control mechanism for network diffusion, and *vice versa*.

For the purpose of this paper, we take into account both of those functions inherent to the both mechanisms. We take this view, because the natures of recommendation and reputation mechanisms are fundamentally opposed, when regarded from both theoretical and methodological perspectives. More concretely, we categorize recommendation mechanism as a driver of endogenous network patterns (interlocking directorships as cross board ties), and reputation as exogenous tie predictor (audit partner's attribute). Thus, in the explanation of the recommendation processes, reputation attribute effect is used as a control variable, while recommendation controls reputation-driven tie emergence when reputation is the focus of a discussion. Therefore, by defining the mechanisms in such a way, we ensure the presence of a condition of interdependency between them.

2.2. Duality of Demand side Mechanisms in Auditor Selection Context

Social network research has identified that either recommendation or reputation assist buyers in differentiation of experience goods (Davis & Robbins, 2004; Granovetter, 1973; Nelson, 1970; Podolny, 2001; Powell, 1990; Saxton, 1997). Experience goods are defined here as products or services whose quality cannot be evaluated accurately before they are purchased and experienced by consumers (OECD, 2009). The fact that audits are categorized as experience goods makes the differentiation of audits particularly problematic due to the asymmetry of information between the buyer and the seller about quality of audits offered at the audit market (OECD, 2009). That asymmetry is apparent in both mechanisms where decisions on auditor selection seem to be justified in alternative ways, specifically when there is a lack of an experience of the quality of audits.

Indicating the duality of demand side mechanisms, studies found that both recommendation and reputation have an influence on client's choice of auditor (Beattie & Fearnley, 1998; Magri & Baldacchino, 2004; Woo & Koh, 2001; Mayhew, 2001; Kacanski, 2017; Linthicum et al., 2010, Johansen & Pettersson, 2013). On one hand, from the recommendation perspective, literature demonstrated that board members who sit on multiple boards of directors represent an important source of information about experiences with auditors related to costing and behavioral aspects related to assurance services (Beattie & Fearnley, 1998; Magri & Baldacchino, 2004; Woo & Koh, 2001; Herrbach, 2001). Thus, the existence of interlocks between boards of directors serves as an indicator of a potential assimilation of decisions on auditor selection at those boards who share the same member. On the other hand, the literature emphasized that reputation, which represents a direct surrogate for quality experience (Shapiro, 1983, Mayhew, 2001), is also an important determinant of a company's choice of auditor (Kacanski, 2017; Linthicum et al., 2010). From this perspective, reputation serves as an indicator of audit quality that gives additional value to the annual reports, which may be important to external users of financial information who have investment incentives (Mayhew, 2001).

In the following, we provide the outline of relevant literature, upon which the hypotheses are defined. We do this in order to outline theoretical arguments developed in earlier research that are related to both demand mechanisms, after which we will move on to the definition of the hypotheses.

2.3. An Interplay of Recommendation and Reputation Mechanisms in Auditor Selection Process

The study on the American corporate elite by Davis et al. (2003) showed that ideas and rumors discussed at one company in a face-to-face communication may reach up to 97% of all the largest companies' boards in a relative short period. In this study, they demonstrated that cross-board communication plays a vital role in spreading information, thereby indicating that ties between boards may be strong enough that the actual distances between remote boards might be surprisingly short, even though the boards seem to be disconnected (Davis et al., 2003; Sinani et al., 2008). The construct of a 'small world' they develop shows that board-to-board ties, in fact, exist, regardless of the fact

that the ties might not seem to be obvious. Precisely those ties may be an indication of a mechanism for identification of a presence of diffusion of corporate practices, strategies and structures between the connected boards (Davis et al., 2003). This indication shows that in order to understand a board's decisions, it is necessary to identify relations that a focal board has established with the other boards. This is because the decisions of one board may rather be a function of cross-board communication than a corporate self-practice, which aside from assimilation of practices among connected companies also enables the focal company to justify decisions by providing that sense of comfort. In the light of this, the literature argued that interlock ties, in fact, may serve as intermediaries in the process of spreading of information on experiences between the boards (Bouwman, 2011; Chiu et al., 2009; Rao et al., 2000; Davis & Greve, 1997).

In the context of this study, audits are categorized as experience goods since their quality cannot be determined before the service is provided, report delivered, and finally, evaluated by the clients (Davis & Robbins, 2004; Granovetter, 1973; Nelson, 1970; Podolny, 2001; Powell, 1990; Saxton, 1997). Because of the lack of information on quality of audits, boards tend to obtain that information from the others, particularly those who already have experienced the quality. Since the auditor selection process is principally categorized as uncertain (Podolny, 1994), relations with the other boards would permit the focal boards to make informed decisions on which auditor to appoint (Podolny, 2001). In this way, directors who interlock act as mediators, or 'pipes', in this cross-board recommendation-sharing processes (Podolny, 2001). As a result, a temporal/periodical character of board members' engagements with different companies enables them to be the core social actors influencing the outcomes of decision-making processes in all the boards they represent (Granovetter, 2005; Carpenter & Westphal, 2001; Shropshire, 2010).

Podolny (2001) argued that the networks, which represent the combination of ties established between the companies, can be the 'pipes of the market' as they work as 'the channels of conducts through which "market stuff" flows, where the "market stuff" encompasses information about exchange opportunities' (Johansen & Pettersson, 2013). By acknowledging that cross-board ties are critical to corporate decisions (Bouwman, 2011; Chiu et al., 2009; Baker, 1990; Uzzi & Lancaster, 2004), a number of studies were developed to address the function that those ties have in an auditor selection context (e.g. Beattie & Fearnley, 1998; Magri & Baldacchino, 2004; Woo & Koh, 2001). Literature showed that the presence of supervisory directors on boards of directors who hold multiple affiliations have a fundamental role in the process of the spread of information about ideas, experiences and practices that may further impact the decision-making processes in a focal company (Bizjak, Lemmon & Whitby, 2009; Bouwman, 2011; Chiu, Teoh & Tian, 2009; Davis & Greve, 1997; Gulati & Westphal, 1999; Haunschild, 1993; Haunschild & Beckman, 1998; Horton, Millo & Serafeim, 2012; Larcker et al., 2005; Ortiz-de-Mandojana et al., 2012; Rao, Davis &Ward, 2000; Beattie & Fearnley, 1998; Magri & Baldacchino, 2004).

In this context, the uncertainty involved in auditor choice gives prominence to social networks as a possible explanation of auditor selection process (Seabright, 1992). Literature on uncertainties that are involved in auditor choices suggest that the way in which networks are used to mitigate uncertainty depends on whether the uncertainty is company specific or market-based (Beckman et al., 2004). While the company specific uncertainty enables the companies to select partners who are unknown, as a form of exploration, the latter leads the boards to re-select the partners they already interacted with in order to minimize risks (Beckman et al., Podolny, 1994). As all the buyers of audits bear certain level of risk, the network perspective advocates that previous experiences are likely to impact decisions, as they provide knowledge and a basis for evaluation (Podolny, 2004), along with the information about the reliability and capability of a potential partner (Beckman et al., 2004). Such knowledge sharing between boards is assumed to be valuable to focal board since board colleagues are considered to be a 'trusted source' of knowledge (Carpenter & Westphal, 2001), as the

information shared between two boards through interlocks are perceived as not being observable by outsiders (Shropshire, 2010). Therefore, focal boards would expect from board members who interlock to bring their knowledge about partners they acquired during engagements in other companies to the focal company. Social network research showed that if the focal company is able to access referrals about a potential partner from a connected company, then it is likely that the focal company will engage that partner (Baker, 1990; Uzzi, 1996). This further reflects the preference for embedded relationships (Baum et al., 2005; Shipilov, 2012) and the need for trust and certainties (Beckman et al., 2004; Podolny, 1994) that lead to reduction of the risks of making uninformed auditor choices. By predicting that this logic operates in the audit market when non-executive directors on the focal board are connected to potentially incoming auditors via their position on an interlock board, studies found a positive association between the connection between non-executive directors with the likelihood that the audit partner is selected (Johansen and Pettersson, 2013).

On the other hand, in recent discussions on auditor choices it became apparent that buyers of audits, instead of basing decisions on previous experiences, tended to base their choices of preferred audit partner on the level of focal partner's reputation (Magri & Baldacchino, 2004; Kacanski, 2017). Although the concept of reputation is one of the two demand side mechanisms to enable differentiation of experience goods, it has relatively recently taken over the spotlight in auditing research. Magri & Baldacchino (2004) stated the importance of extending discussions on reputation-driven auditor selection by arguing that the social perception of an auditor may impact the social perception of the focal company as well, which afterwards plays role in determination the company's social standing. Craik (2009) asserted that reputation rather operates at the level of network, rather than on an actor level. Also, it has the capacity to recreate structures of social relationships, as incentives of a particular actor determine the distribution of network dynamics (Craik, 2009).

Regardless of rich theoretical debates on the meaning of the concept of reputation, there is a common ground based on which the concept is understood. Reputation – an intangible asset (Goldberg et al., 2003) – is understood as a perceptual representation of one's past actions and future prospects that describes their overall social appeal (Fombrun, 1996: 72). Reputation is a value that emerges in the eyes of others (Stuart, Hoang & Hybels, 1999; Turban & Cable, 2003), and its value can be both positive and negative (Brewer et al., 2002; Henrich & Gil-White, 2001, Highhouse et al., 2009). It is considered as an objective measure of perceptual identity that is estimated by a combination of particularly defined criteria (Brewer et al., 2002; Henrich & Gil-White, 2001), whose socially constructed measure comes from appraisals given by individuals' perceptions (Lopez et al., 2010). Reputation is difficult to obtain and a fragile commodity that may be easily lost (Miles & Covin, 2002), because it is not self-attainable (Turban & Cable, 2003). In this paper we use the definition from Zinko et al. (2007), who defined reputation as *'a perceptual identity formed from the collective perceptions of others, which is reflective of the complex combination of salient personal characteristics and accomplishments, demonstrated behavior, and intended images presented over some period of time as observed directly and/or reported from secondary sources, which reduces ambiguity about expected future behavior'*. The concept of reputation is built on a combination of attributes which, in summary, give reputation scores that may be assigned to any social actor, i.e. individuals, companies, organizations etc. (e.g. The Reputation Institute[1]). For those social actors considered as reputable, it is typical that they have competitive advantages relative to others, which further enables them to sustain their own viability (Barney, 1991; Deephouse, 2000).

[1] The Reputation Institute (RepTrak®) provides quantitative measures of company reputation scores appraised by the following seven categories: product/service, innovation, workplace, governance, citizenship, leadership and performance. The scores aim at helping different stakeholders to more objectively perceive the level of legitimacy and trustworthiness of focal business entities (Parkhe, 1993).

The expansion of the Big Four audit firms on international markets is closely related to the provision of high-quality audit and advisory services, which enabled the audit firms to gain an eminent reputation worldwide (Saito & Takeda, 2014). Conversely, should the Big Four auditors deliver low quality audits, they increase the risk of losing their positive reputation (DeAngelo, 1981). Centralization of governance of the Big Four makes them susceptible not only to local audit scandals but also to central audit failures, as seen in the infamous Arthur Andersen's scandal with regard to the Enron case in October 2001. Aronmwan et al. (2013) developed three categories of audit firms: (1) Big Four, (2) BDO and Grand Thornton, and (3) all the other firms, stating that both audit quality and reputation may be inferred by an audit firm category. Also, Mayhew (2001) asserts that reputation has cyclical transitive formation process, assembled of three actors who jointly scale auditor reputation level – clients, investors and auditors. Where clients, with incentives to boost the quality of financial statements, engage reputable auditors to attract potential investors, who require reliable information to make investment decisions, while auditors are interested in providing the best quality of audits to prove themselves as good auditors (Mayhew, 2001). Because of the importance of public image for business entities, companies are likely to express their readiness to pay audit premiums, which is considered to be a direct investment in companies' public image (Johansen & Pettersson, 2013), in order to receive audit services from those auditors considered reputable (Magri & Baldacchino, 2004). This further leads to companies' increased expectations related to raising the credibility of both the business entity and their financial statements (Simunic & Stein, 1987).

Several studies have been conducted to identify potential presence of reputation effect on auditor choice (e.g. Asthana et al., 2007; Kanagaretham et al., 2010; Almer et al., 2014; Aronmwan et al., 2013; Kacanski, 2017). Literature suggested that clients tend to express the interest in paying audit fee premiums, as relations with them enable the companies to boost own social image (Kacanski, 2017; Asthana et al., 2007; Kanagaretham et al., 2010; Almer et al., 2014; Aronmwan et al., 2013). Engaging reputable partners has multiple positive implications for corporate social standing, where one indication is the positive change in stock market value (Ashtana et al., 2007). However, not all choices of partners ensure enhancements in company's reputation. Studies found that the switch between audit firm categories is less favorable for both stock market and reputation if the change is made from Big Four to non-Big Four, than if otherwise (Moizer, 1997). This is due to the fact that the first scenario could be publicly perceived as a positive signal for future growth prospects, whereas the latter might signalize difficulties (Brocard, Franke, & Voeller, 2018). Social network research proves the previous arguments by demonstrating that companies are prone to selection of reputable audit partners (Kacanski, 2017). The selection of reputable partners serves as a tool for status transfer through which companies identify themselves, which further increase the recognition in the social environment to which the focal company belongs. Accordingly, the relation with reputable partner may also serve as a remedy for re-boosting of social standing for those companies that have established relations with those who have lower reputation levels (Kacanski, 2017).

In summary, the previous literature asserts that both cross-board knowledge transfer and auditor reputation have important functions in auditor selection, however, only when each of them is observed in isolation from the potential effects of the other. From the social network theory perspective, which presupposes the interdependence between those two mechanisms, the existence of a potential interplay between the two mechanisms is understated in the previous literature, because the studies did not account for a possible prevalence of one mechanism in the mutual presence of the other to argue for their significances.

Acknowledging the literature which argued that interlocks establish for a particular purpose, e.g. shared ownership, capital allocation, or formation of interdependencies between companies (e.g. Mizruchi and Stearns, 1988; Pfeffer, 1972; Allen, 1978, Stockman *et al.*, 1985; Zeitlin, 1974; Pfeffer

and Salanc 1978), the interlocks could also be driven by incentives of focal boards to use interlock ties as a strategy for increasing proximity with potential audit partner (Podolny, 2001; Baker, 1990; Uzzi and Lancaster, 2004; Courtney and Jubb, 2005), who is considered as reputable (Magri & Baldacchino, 2004). Negotiations with reputable partners on audit engagements may be challenging for some companies, as auditors may be less willing to accept the new engagements. This is because the reputable partners are usually under pressure with current audits (Linthicum et al., 2001), and therefore, are highly selective when it comes to the new clients, as they want to protect their reputation through a minimization of risk of failure they could be exposed to due to a lack of knowledge about the new client. However, it would be possible to expect that an interlock between the two boards could be an outcome of a strategy for increasing proximity with the reputable partner for the focal company, which further increases likelihood of acceptance of new engagements by reputable partners. This is because the reputable partners are more willing to accept the offer for engagements received from the new client, if their existing client has an interlock with the focal company (Podolny, 2001; Baker, 1990; Uzzi and Lancaster, 2004; Courtney and Jubb, 2005).

In formal terms, we would expect that recommendation driven interlock-based incentives enable the reputation mechanism to release in auditor selection context, which further predicts that it is not only likely that boards who share board member will engage the same partner, but also that this partner is expected to be a reputable one. In this sense, we could predict that the interplay between recommendation and reputation exists, and that the partner selection is not driven by either mechanism, which implies that they are not mutually exclusive, but that they jointly create a platform upon which the selection of partners unfolds. As a result, we expect to find that both reputation and recommendation mechanisms are important drivers of network structure when both of them are present in the estimation of a propensity of network tie emergence, where such an outcome would further indicate that the two of them create an interplay in establishing the social network structure.

First, following the assumption that both recommendation and reputation play a role in auditor selection process we predict the following:

H1a: The recommendation mechanism has significant influence on auditor selection process when reputation effect is present in the observation.
H1b: The reputation mechanism has significant influence on auditor selection when recommendation effect is present in the observation.

Second, by observing both of them in their joint presence and conditioning on interdependence between the mechanisms, we define the following hypothesis:

H2: Recommendation and reputation mechanisms create an interplay in auditor selection process.

The empirical results of the test of the hypotheses here are not *ex ante* obvious, since conditional interdependence between the mechanisms observed through the lenses of network methodology that enables testing the interplay between them may result in statistical significance of one out of two alternative mechanisms. This is because the effect of one of them may give insignificant parameter estimate due to a potential prevalence of the other one within the same observation – which earlier research did not address. Therefore, we assert that it is important to first reflect upon the existence of significances of both mechanisms in a joint model in which both of them are present, in order to use this as a valid assumption to discuss the presence of an interplay between the two mechanisms.

3. Research Context, Data and Method

To investigate the interplay of recommendation and reputation as demand-side mechanisms related to experience goods on auditor selection processes, we use data that are collected as part of a larger study on the development of social selection mechanisms in a Danish corporate governance context (Kacanski, 2017). The following section provides further information on the corporate governance system in Denmark, together with the source of network data and analytical frameworks.

3.1. The Corporate Governance System in Denmark

The Danish system of corporate governance is a classical two-tier arrangement comprised of supervisory board members and executive directors (Johansen & Pettersson, 2013; Kacanski, 2017; Sundgren, 1998).

According to the European directive on statutory audits, each supervisory board of directors is obliged to appoint an audit firm. Supervisory boards announce decisions on the selection of statutory auditors at the annual general meeting (AGM). Decisions on auditor appointments are preceded by the board's examination of potential auditors, where the examination is conducted only on those auditors recommended by audit committees (Johansen & Pettersson, 2013).

The Danish regulation on mandatory audits (Revisorkommissionen, 2006) legislated to limit the freedom to conduct joint audits in 2005, which had been in effect since 1930, and similar regulations are still in effect in other countries such as France (Thingaard & Kietzner, 2008). This regulation prevents companies from simultaneously engaging more than one audit firm, in order to suppress the development of conflicts of interest and remove potential risks of misalignments in opinions caused by differences in audit methodologies used by audit firms (Revisorkommissionen, 2006). Moreover, this regulation obliges the audit partners, who represent the audit team leaders, to personally sign off on audit reports, which is considered an indication of the responsibility that the partners take on in their engagements with clients. It is common audit practice that two audit partners sign off on a single audit report, although there are a few examples of a single audit partner signature. This regulation is aimed at transferring accountability for audits from audit firms to partners in order to reduce audit firms' exposure to partners' failures.

3.1.1. The Role of Auditors and Boards

In Denmark**,** the duality of function between the chief executive officer and the chairperson of the non-executive board is strongly prohibited. This implies that supervisory board members are the only ones allowed affiliations with multiple boards, while the same rule does not apply to executive directors.

The Danish corporate governance system is characterized by a long tradition of strong relations between members of supervisory boards and external auditors, both legally and in practice. On one hand, financial statements are the responsibility of both the supervisory board and the management board (Johansen & Pettersson, 2013), unlike in the US, where they are the responsibility of executive management (Bush, 2005). Since 1917, external auditors are also obliged to compose a long form of audit report for the supervisory boards, describing audit findings in detail. The long form of audit reports is similar to the 'additional report to the audit committee' proposed by the European Commission (2011). The report is kept confidential as the auditor record at the company's premises, and must be accessible at every board meeting. Lastly, company law stipulates requirements for supervisory boards to consider when they are assessing auditors and audit findings. Accordingly, the supervisory board and the auditors are strongly connected in both intent and effect in the Danish corporate governance system (Johansen & Pettersson, 2013).

3.2. Data

In order to observe the auditor selection mechanism and investigate the prevalence of network structuring effects, we model multiple social selection across a period of five years, from 2010 to 2014. Aside from limiting our sample period to avoid changes in corporate laws and audit regulations, we also keep our case separated from two relatively recent mergers that took place in Denmark in 2008 and 2014. We do this in order to observe mechanisms across the substantially stable period in order to understand what tendencies toward auditor selection exist during the observed period. The results from our study may be further utilized as a control model for observing disturbances which may occur if regulatory changes or changes at audit firm level occur.

To investigate how interlocking directorship networ272ks interfere with auditor selection processes in relation to the duality of the demand mechanisms of this study, we collected relational data for the Danish case from publicly available annual financial statements. We selected the samples from companies that were listed on the Danish stock exchange for each of the five years. The list of companies was identified via 'interim reports on equity trading' published by Nasdaq OMX Copenhagen on 31 December for each year of observation. Those reports comprise information about companies' assets that have been listed and de-listed during those years. Based on the lists of companies, we collected the annual statements for each company from *Virk.dk*, companies' websites or by directly contacting companies' investor relation departments to collect missing data.

In total we accumulated 774 annual statements for an average of 155 companies per year for each observation from 2010 to 2014. The condition of completeness for network studies was fulfilled (Robins, 2015), as we collected data that matches the entire population of all Danish listed companies. Data about board members and audit partners were collected from a total of 191 unique business entities across the five-year period. Business entities that were considered for the investigation include both financial and non-financial organizations. The total number of 1761 unique board members, including the 297 audit partners who signed off their audit reports and were affiliated with 17 audit firms in all, were extracted from the annual statements.

Reputation scores were developed as binary attributes by partially following the argument of Aronmwan et al. (2013). Instead of categorizing companies into three levels, we categorized companies either as reputable or non-reputable, depending on whether they belonged to the Big Four or non-Big Four, respectively. Since our models deal with individuals and not with audit firms, partners who were affiliated with a Big Four audit firms during the particular year of observation received the attribute 1, or 0 if there was no affiliation.

In order to prepare the data for statistical modeling, we first extracted all relevant data on actors, relations and attributes and entered into a single spreadsheet, which was further converted into the .csv file readable in Visone (Brandes & Wagner, 2004). The latter is a network visualization tool that enables extracting and exporting relational data from Excel files into adjacency matrices in .txt format that is further readable by MPNet (Wang et al., 2018), which we finally used to develop statistical models.

3.3. Variables and Measures

For our empirical analysis, we estimate a model for the probability of auditor selection ties as a function of the two demand-side aspects derived from the supervisory directorship network, auditor selection network (exogenous/attribute effects) and network endogenous parameters. In the following, we explain the different elements of our model and highlight why it is important to account for network endogeneity in order to avoid spurious modeling results.

3.3.1. The network

The networks we developed and modeled for each year of observation are categorized as multilevel (Robins, 2015). A multilevel network is comprised of two types of nodes representing supervisory board members and audit partners, along with the ties connecting them (for a similar approach, see for instance Kacanski, 2017). Ties interconnecting supervisory board members represent their collaborations on particular boards, which indicate their direct connections or 'pipes' (Podolny, 2001) through which information on knowledge and experiences about auditor engagements are shared. The second group of ties shows the selection of audit partners made by supervisory board members. The fact that supervisory board members can simultaneously sit on multiple boards and thus create interlocks implies that they are, at the same time, connected with all the other board members on each board they represent. On the other hand, the ties between board representatives and audit partners indicate decisions that board members make on the appointment of audit partners. Those ties neglect other relations that boards can establish regarding other advisory services that audit firms might offer to the companies. All the ties are recorded dichotomously and arranged in ten binary adjacency matrices (two for each multilevel network) $\mathrm{x} = \{x_{ij}\}$ in which cell x_{ij} corresponds to i's relation to inventory j. If i sits on the same board with j (in the top-level network), and if i engaged auditor j (in the meso-level network), cell x_{ij} is coded as 1, and 0 if not, in both types of matrices.

According to the multilevel network specifications, the two-level network is traditionally comprised of top, meso, and bottom levels (Robins, 2015). We present a simplified visualization of the multilevel network in Figure 1. In so doing, we indicate that, in this paper, we simultaneously and exclusively observed demand mechanisms from top- and meso-level perspectives (Robins, 2015; Kacanski, 2017; Lusher et al., 2013). The bottom level is omitted from the study following the assumption that audit partners do not have any direct influence on corporate decisions on auditor appointment (Baker, 1990; Uzzi & Lancaster, 2004). Even though the top-level network parameters do not directly relate to the hypotheses, it was necessary to include them in the network parameter estimations in order to provide insights into how the structures of corporate board networks condition the exchange of knowledge and experience among board representatives. Had those parameters been excluded from the models, they would not have provided stronger arguments for how corporate board network structures condition the auditor selection process.

In the following visualization given in Figure 1, the top level represents the network comprised of supervisory board members (blue squares) and relations between them (dashed lines). We treat individual board members as nodes, rather than boards of directors as units (Seabright et al., 1992). In this way, each unit of board of directors was transformed into clique-based network formations (Robins, 2015, Lusher et al., 2013) in order to account for the presence of individual board members on a single board of directors and ties between them. Those board members who represent boards in more than one company have ties established with all the other board members who sit on each company board they themselves are affiliated with (Baker, 1990; Uzzi & Lancaster, 2004; Courtney & Jubb, 2005). More concretely, the transformation of boards (firms) as single nodes into clique-based structures of board members enables deconstruction on simple triadic network configurations into complex multi-triadic formations. Clique-based structures convert firm-to-firm ties into the nodes of board members who establish ties across different boards. As a result, this approach enabled us to identify a function that more active (or more popular) board members who represent multiple boards have on auditor selection process across the boards. The omission of such an approach would limit our findings as incorporation of (ATA) parameter into the measurements of closure effects on firm-to-firm ties would only be capable of capturing function that firm clusters, which therefore connected through the interlocks, have on selection of auditors. However, following the theoretical assumption that SNA is built upon, the disaggregation of individual board

representatives from boards enabled us to account on actor's individuality based on which we could measure the function that board members have on auditor selection process across multiple boards they represent and not only on firms as a whole, in which case that information would be missing.

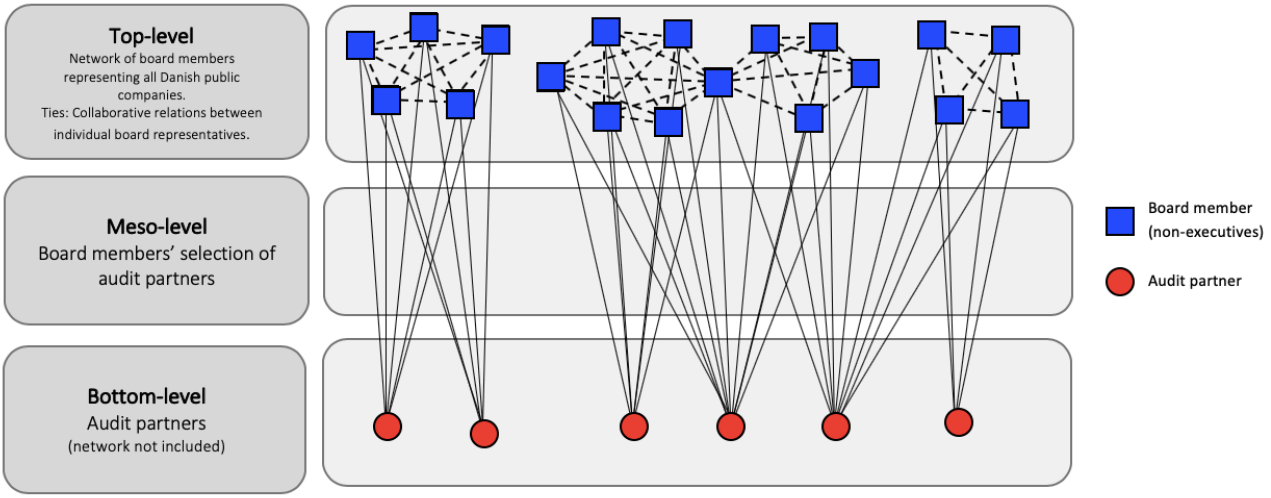


Figure 1- Schematic visualization of a multilevel network

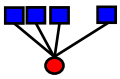
The meso-level network represents the choice of audit partners made by supervisory boards. Solid lines between the two levels (blue squares and red circles) indicate bi-partite (cross-level) network ties (Robins, 2015), where board members have ties established with those audit partners they engage to carry out the mandatory audits. Because boards appoint two audit partners affiliated with the same audit firm, the outcome of the network structure is that each board member has two solid ties with two audit partners affiliated within the same audit firm. In the cases of interlocking directorships, where one board member represents more than one corporate board (Baker, 1990; Uzzi & Lancaster, 2004; Courtney & Jubb, 2005), then those board members have ties established to all audit partners that were selected by each company that board member represents. In this case, we do not distinguish between the new and incumbent auditor (Johansen & Pettersson, 2013), as we analyze data from multiple cross-sectional perspectives taking into account the current audit engagements in the particular year of observation.

3.3.2. Analytical framework – Exponential random graph models

We analyze our data by applying exponential random graph models (ERGMs; for an introduction, see Lusher et al., 2013) to multilevel networks (Wang et al., 2013) as this methodology enables integration of both theoretical assumptions to identify the presence of an interplay between the mechanisms.

ERGMs assume that social networks are comprised of local substructures representing social mechanisms that explain the presence of ties (Lusher et al., 2013). ERGMs have been developed to account for dependencies in network structures. The models they produce, describe patterns characterizing an observed network by modeling stochastic processes in which the presence of a particular tie is influenced by the presence or absence of other ties or exogenous attributes (Lusher et al., 2013). ERGMs have capacity to simultaneously estimate multiple parameters, where parameters account for the presence of the other network structural effects – which resemble the actual social processes (Robins, Pattison, Kalish, & Lusher, 2007). Unlike the other statistical approaches in the

Table 1. Summary of network effects included in exponential random graph models

Pattern	Visualization	Interpretation
Top-level structural parameters (control effects)		
Edge		A baseline propensity to a tie formation – a control effect that is included in any network model.
Star parameter ASA*		Parameter measures the presence of highly central board members who are more popular than the others in the overall board membership network. It models the degree distribution.
One-mode level closure parameter ATA		Triadic closure parameter measures tendencies that particular pair of board members connects with multiple same other board members across the overall network.
One-mode level clustering parameter - indirect connectivity A2PA		This parameter controls whether ties with multiple other board members establish without the existence of a tie between board members. Clustering parameter should have an opposite direction from closure parameter.
Meso-level structural parameters (Hypothesis 1)		
XEdge		A baseline propensity to a meso-level tie formation – a control effect that is normally included in any network model.
Auditor popularity effect *(H1a)* XASB		Parameter measures the presence of highly central audit partners in the overall network structure. It indicates that those audit partners who are more popular than the others, are more likely to be selected.
Two-mode closure effect *(H1a)* ATXAX		Triadic closure parameter measures tendencies that a pair of board members sitting on the same board at the entire network scale will select multiple same audit partners.
Two-mode clustering effect XACB *(control effect)*		Clustering effect controls for the closure effect and indicates that two board members who do not represent the same board will select the same multiple audit partners. This measure should have an opposite direction from closure parameter in this instance.
Auditor-centered clustering effect *(H1a)* XACA		This parameter measures the propensity that two audit partners are selected by the same multiple board member representatives.
Reputation interactions (Hypothesis 2)		
Board member engaging with auditor who is an attribute holder *(H1b)* XEdgeB		Parameter measures general tendency that board members will select audit partners who are reputable.
Two board members engaging the same popular auditor who is an attribute holder *(H1b)* XStarB010		Akin to the previous parameter, it measures the propensity that more board members select the same audit partner who is considered as reputable.
Board member engaging with two auditors that hold the same attribute *(H1b)* XStarB101		Tendency that board members select more audit partners where all of them are considered as reputable.

**Indicates name/abbreviation for network parameters according to Wang et al., 2013*

family of network analyses, ERGMs do not operate at the dyadic level, but their outcome is the overall structure of the network. The models treat the whole network as a single observation, thus freeing it from any independence assumptions (Wang et al., 2013, 2016). As social ties imply dependence, we consider this to be a major strength of our modeling approach, which is of theoretical as well as empirical importance for the analysis of our research question.

Multilevel ERGMs enable us to account for complex top- and cross-level dependencies, such as the influence of corporate board structures on auditor selection processes through popularity and closure network effects. Stated formally, multilevel ERGMs express the probability of the overall network structure in terms of parameters associated with specific effects or local patterns within the network. They focus on the interaction between two networks – in our case, the supervisory board network and the board-auditor network. At the same time, they allow for taking into account auditors' attributes as exogenous predictors of the network structure (Wang et al., 2013, 2016). Multilevel ERGMs have the general form:

$$Pr(M = m, Y = y) = \left(\frac{1}{k}\right) exp\left(\sum_Q \Theta_Q Z_Q(m, y)\right) \quad (1)$$

where (i) $M = [A, X, B]$ denotes the multilevel network variable, and $m = [a, x, b]$ denotes the corresponding realizations. *M* is composed of a top-level network A (in our case the supervisory board member network), a meso-level network X (the network between supervisory board members and audit partners), and a bottom-level network B – the network of audit partners which is excluded from the study; (ii) *Y* is an array of actor attributes with realizations *y*; (iii) $Z_Q\ (m, y)$ is a network statistic counting the number of network patterns of type *Q* for a particular network realization *m* and given the vector of actor attributes *y*; (iv) Θ_Q is the parameter corresponding to the statistic $Z_Q\ (m, y)$; and (v) *k* is a normalizing constant included to ensure that (1) is a proper probability distribution. The above equation describes a probability distribution of multilevel networks with *u* nodes at one level and *v* nodes at the other. The probability of observing any particular network *m* in this distribution (including the one that is actually being observed) is dependent both on the statistics $Z_Q\ (m, y)$ and the corresponding parameter values Θ_Q for all effects in the model.

The objective of using ERGMs is to investigate which patterns characterize an observed network and, on that basis, to draw conclusions about the choice processes that determine the creation of ties. The patterns included in the model are determined by theory-based dependence assumptions regarding tie creation and exogenous effects – such as the recommendation and reputation demand mechanisms discussed above. To estimate our models, we use MPNet software (Wang et al., 2013) instead of RSiena (Ripley et al., 2018) by applying Markov chain Monte Carlo maximum likelihood (MCMCML) estimations (Snijders et al., 2006; van Duijn et al., 2009). We use ERGMs because this study is of a multiple cross-sectional character, where the aim is to estimate probabilities for tie emergence, instead of observing the process network change over time. If cross-panel repeated measures of network parameters on the same given set of nodes were our intention, then RSiena would have been a better fit for this study (Ripley et al., 2018).

3.3.3. Network Endogenous and Exogenous Effects

Prior research on social selection mechanisms (Lusher et al., 2013; Wang et al., 2013) in corporate governance contexts has shown that networks are characterized by complex endogenous dependencies, as the creation of social selection ties is determined by individuals' own patterns. To account for that tendency of social networks to self-organize into meaningful structural patterns (Robins et al., 2005), we include network endogenous effects. These effects represent theoretical claims on the processes that drive the emergence of network patterns and are thus more than

theoretical ameliorations (Lomi et al., 2014). Omitting network endogenous effects could lead to invalid findings on the effects that are of theoretical interest and as a result may be attributable to structural mechanisms driving the emergence of ties (Robins et al., 2007; Snijders, 2011). In order to isolate the social influence processes in auditor selection networks, we consider the network endogenous effects outlined in Table 1 as single and cross-level structural parameters. Controlling for the simplest form of dependence that exists at the dyadic level, we account for the overall tendency of board members to create ties with the other corporate board members (Edge) and auditors (XEdge). Since dyadic dependencies alone are insufficient to capture network endogenous effects (Lomi et al., 2014; Robins et al., 2009; Snijders, 2011), we additionally take into account *star* parameters (popularity effect – ASA, XASA) and *closure* parameters (ATA, ATXAX).

Both star parameters control for degree distribution of both top- and meso-level networks and reflect the findings that ties in social networks are seldom distributed evenly (Robins et al., 2009). We also include effects to capture clustering, specifically tendencies to create closure (Robins et al., 2009), which is the tendency for ties to be created between individuals who already share common ties (Davis, 1970; Rank et al., 2010).

Finally, we include exogenous attribute effects to account for the tendency of board members to create ties with those auditors holding the reputation attribute. The last section of Table 1 that refers to *reputation interaction* summarizes the attribute network patterns that refer to social selection processes, whose parameters were also estimated in the same models. Those particular attribute parameters are modelled to estimate general propensity for selection of reputable auditor (XEdgeB), tendencies for multiple boards members selection of particular reputable auditor (X2StarB010), but also selection of multiple reputable auditors by a single board member (X2Star101).

4. Results

4.1. Descriptive Statistics

Table 2 provides descriptive measures for the variables in our study. Sample sizes do not differ considerably from each other across the five-year period, considering the number of board representatives affiliated with the selected companies and the number of auditors engaged by those companies (145–165). There is a notable slight decline in both the number of boards of directors

Table 2. Descriptive statistics

Sample information	**2010**	**2011**	**2012**	**2013**	**2014**
Number of companies	165	162	153	149	145
Number of boards of directors	969	962	922	897	894
Number of audit partners	186	188	167	160	162
Average number of members per board of directors	m=6.45 SD=2.62	m=6.63 SD=2.52	m=6.71 SD=2.61	m=6.71 SD=2.73	m=6.68 SD=2.61
Average number of audit partners per client (company)	m=1,91 SD=0,54	m=1.91 SD=0.46	m=1.89 SD=0.42	m=1.89 SD=0.48	m=1.82 SD=0.38
Average number of interlocks per board of directors	m=1.12 SD=0.42	m=1.16 SD=0.43	m=1.11 SD=0.44	m=1.11 SD=0.44	m=1.11 SD=0.43
Average number of audit engagements per auditor	m=1.67 SD=1.13	m=1.64 SD=1.17	m=1.73 SD=1.23	m=1.75 SD=1.08	m=1.63 SD=1.17
Number of ties on top-level network	7926	7846	7630	7506	7501
Number of ties on meso-level network	2019	2036	1927	1908	1831
Density of board member network	0.89%	0.92%	0.88%	0.91%	0.87%
Density of a meso-level auditor engagement network	0.24%	0.19%	0.22%	0.19%	0.20%

representing companies and the number of audit partners, which corresponds with the change in the number of listed companies on the stock exchange in that period.

Although the relative decrease in the number of listed companies is apparent, the descriptive statistic measures and network statistics hold consistent values across the years. Values presented in this subsection represent the averages of values presented in Table 2 for the entire period. The average number of supervisory board members per board is 6.64, with a standard deviation of 2.62. The average number of audit partners responsible for audits is 1.88 per client with an average deviation of 0.46, which corresponds with the regulation on mandatory audits. Each Danish supervisory board has on average 1.12 interlocks, with a standard deviation of 0.43, which indicates that corporate governance networks are well interconnected within the public corporate governance structure, but also that not many multi-board positions are occupied by a single board member. Densities of both board and board-auditor networks are low, due to a large number of nodes and small number of ties connecting them, relative to the number of possible ties that might occur in the network. This is a result of both structural and regulatory boundaries that influenced localization of ties.

4.2. Network Analysis

Table 3 contains the results of model estimations for each observed year. The results in Table 3 are arranged into horizontal and vertical sections. The first horizontal section outlines parameter estimates related to top-level network structuring effects (supervisory board membership) for each of the five models. With respect to *H1a*, the second section in Table 3 provides the meso-level network parameters to outline the network statistics indicative of recommendation driven auditor selection mechanisms, also for each of five years of observation. The third part of the table comprises the attribute effects included in the exponential models to test *H1b*. On the other hand, vertical sections present the list and statistics for each network parameter introduced into the individual model. Conditional on all other patterns in the model, a positive parameter indicates that the pattern is observed more often in the network than we would expect if ties emerged randomly, while a negative parameter indicates that the pattern is observed less frequently. Similar to a logistic regression, the size of the parameter estimates can be interpreted in terms of (conditional) log odds. For every increase of a value by one unit, the conditional odds of observing the auditor engagement tie as a social selection mechanism increase by a factor that can be obtained by calculating the exponential function of the parameter (Hunter et al., 2008; Robins & Daraganova, 2013).

With regard to our research question addressing the interplay of two demand mechanisms – recommendation and reputation - in the context of auditor selection processes, in general, the results of model estimations reveal that the networks in each year of observation are characterized by a number of both single- and multilevel patterns that emerge more or less often than expected from their random occurrences. Although the parameter estimates are not fully consistent across the years in terms of the strengths of the effects, clear trends concerning the structuring principles of multilevel networks were identified and presented below. In the following, we outline the findings by discussing the network statistics before we discuss the goodness of fit of the models.

4.2.1. Results of the Exponential Random Graph Models

Top-level and meso-network effects capture structuring principles of the supervisory board network and their selection of auditors. Theoretically driven selection of the structuring principles is accompanied by control parameters in order to enable a good fit of the models and provide model convergence (Wang et al., 2013, 2016).

Table 3. Results of the exponential random graph models for selected years

Network parameter	Models				
	2010	**2011**	**2012**	**2013**	**2014**
Network endogenous patterns – board-level network	Parameter (st. dev.)	Parameter (st. dev.)	Parameter (st. dev.)	Parameter (st. dev.)	Parameter (st. dev.)
Tie formation propensity - Edge	-6.363* (0.738)	-6.1576* (0.929)	-7.6947* (0.651)	-7.6168* (0.546)	-6.579* (0.889)
Star2A	-0.3401* (0.013)	-0.1188** (0.009)	-0.0767** (0.011)	-0.1577** (0.008)	-0.0526* (0.009)
Star3A	-	-	-	-0.0082* (0.001)	-
Star parameter - ASA	0.5767* (0.190)	0.5285* (1.377)	0.9533* (0.166)	0.9342* (0.144)	0.6804* (0.227)
One-mode level closure - ATA	1.2425* (0.017)	1.0835** (0.023)	1.0897* (0.321)	1.5507** (0.023)	1.1763* (0.320)
One-mode level indirect connectivity - A2PA	-0.4307 (0.308)	-0.3724 (0.213)	-0.3700 (0.208)	-0.4072 (0.337)	-0.424 (0.246)
Network endogenous patterns – board-auditor network *(H1a)*					
Tie formation propensity – two-mode - XEdge	-7.1548* (0.087)	-5.9081* (0.329)	-5.7027* (0.367)	-5.3702* (0.372)	-6.9189* (0.107)
XStar2B	-0.0039 (0.003)	-	-	-	-
Star parameter – popularity effect (B) XASB	0.9145** (0.028)	2.2892* (0.095)	2.9235* (0.106)	2.4421* (0.103)	0.8882** (0.034)
Clustering – A node cluster XACA	1.9236* (0.087)	2.1141* (0.027)	2.9214* (0.104)	1.8336* (0.329)	2.6159* (0.104)
Clustering – B node cluster XACB	-0.7881 (0.594)	-1.0325 (0.714)	-0.6331 (0.462)	-0.652 (0.331)	-0.907 (0.646)
Two-mode level closure parameter - ATXAX	1.9149* (0.058)	1.5623* (0.204)	1.8808* (0.084)	1.0176* (0.031)	1.5114* (0.026)
Attribute effects – two mode social selection models *(H1b)*					
Audit firm reputation attribute effect					
General tendency toward selection of reputable auditor XEdgeB	0.2363* (0.102)	0.3010* (0.014)	0.2373* (0.087)	0.1423* (0.021)	0.3430* (0.012)
Popularity effect for reputable auditor X2StarB010	0.1731* (0.055)	0.1254* (0.016)	0.3691* (0.143)	1.0191* (0.010)	0.4123* (0.114)
Reputation effect – multiple selection X2StarB101	1.0510* (0.435)	1.0921* (0.322)	0.9912* (0.217)	1.0781* (0.314)	0.9891* (0.218)

* Indicates significant effect at Lambda = 2
** Indicates significant effect at Lambda = 4

The value of $\lambda = 2$ has been used here as an initial value as it has been proven to be reasonable for many ERGMs estimations; however, higher values, as indicated ($\lambda = 4$), contribute convergence in the case of highly skewed degree distributions, (Koskinen & Daraganova, 2013; Robins et al., 2007)

Concerning *H1a*, with respect to structuring principles that address the influence of supervisory board ties on recommendation processes in an auditor selection context, we first find that *star parameter* (ASA) is positive and significant across each model. This parameter is indicative of the presence of highly centralized supervisory board members, which shows that some board members who, by holding relatively higher degree distributions of relational ties with the others in the top-level network, are particularly sought-after as actors possessing relatively more knowledge on experiences with auditors. This could be a result of better knowledge provision, or those supervisory board members might be known as reputable among colleagues (Lusher et al., 2013), which could trigger tendencies toward preferential attachment, e.g. the Matthew effect. Their more central position in the network may indicate that the other supervisory boards tend to achieve better proximity with sought-after auditors. *Closure parameter* (ATA) is also positive and significant in all models, indicating that there is a tendency for ties to be created between board members who share common ties. We assume that positive closure parameter is not primarily a result of the clique-based network formations due to relatively small standard deviation of an average number of members per board of directors, but the interlocks that some board members tend to establish with the members at multiple boards.

In addition, we tested the two-mode level *closure effect* (ATXAX). The closure effect is positive and significant across models, showing that ties developing between supervisory board members condition the presence of ties between supervisory boards and audit partners. In other words, ties between board members direct the selection of multiple same audit partners, which corresponds to *H1a* that, asides from the supervisory directors representing the same boards, interlocks are also influential to the selection of auditors. This indicates that knowledge and experiences on quality of audits is spread among board members, which further drives the auditor selection process across the entire network, also through interlocks. This finding corresponds with the (ATA) parameter where low standard deviation across the observations indicate strong influence of interlocks on engagement partner selection across boards, and also that the significant parameter is not merely an indication of a mechanical consequence of transformation of firm-to-firm ties into clique-based board member network structures. Based on the foregoing, we can conclude that the recommendation mechanism plays an important role in auditor selection processes, and therefore, these findings support *H1a*.

Regarding *H1b* relating to the structuring principles and attribute effects of the reputation-driven auditor selection mechanism, we integrated the auditor *popularity effect* (XASB) with the list of attribute effects to indicate *interaction* between boards and reputable auditors (as the attribute holders). Parameter statistics in all models captured both positive and significant auditor centralization, indicating the presence of a few popular audit partners in the overall network who hold a relatively higher degree distribution compared to other audit partners in the same network. Also, the auditor-centered *clustering effect* (XACA) was included to test whether multiple auditors tended to be selected by multiple same other supervisory board members. Parameter statistics for this configuration are positive and significant. These results are accompanied by three attribute *interaction* effects: general tendency toward selection of a reputable auditor (XEdgeB), tendencies for preferential selection of the same reputable auditor by multiple other board members (XStarB010), and board members' tendency to select multiple reputable auditors (XStarB101). Model estimations showed that across five models, all attribute effects are positive and significant. First, board members have a general tendency toward engaging audit partners who are considered reputable. Second, multiple board members are more likely to select the same reputable auditor. Lastly, single board members tend to engage multiple reputable audit partners. Those findings fully support our *H1b*.

We included the remaining patterns as control variables to account for the influences that alternative parameters have on demand mechanisms in the auditor selection processes. The indirect connectivity or *clustering effect* (A2PA) was included to control for the closure effect in top networks,

which has a negative and insignificant parameter estimate. Similarly, the clustering effect in meso-level networks (XACB) was used to control for the presence of the bi-partite closure effect, and similar to the previous estimate, is also negative and insignificant.

Concerning the network endogenous control variables, the negative (Edge) and (XEdge) effects indicate that, on one hand, it is rare for supervisory board members to create ties with the other board members outside of the other, more complex patterns included in the models. On the other hand, the same rule applies to board members' ties with audit partners, where a negative and significant parameter value shows that boards and auditors rarely establish relations outside the more complex structural patterns that characterize the observed network.

Finally, considering that the test of hypotheses *H1a* and *H1b* showed that, in joint observation of social influence and social selection processes, both mechanisms are positive and significant, we can conclude that, on one hand, mechanisms are not mutually exclusive, and on the other hand, they form an interplay to establish the platform for unfolding of the auditor selection network. Based on those results, we find the support for *H2*.

4.2.2. Goodness of Fit

Based on the procedure suggested by Hunter et al. (2008), we assessed the goodness of fit for each model after the models converged. Goodness of fit (GOF) enables assessing how well the model manages to capture features of data that were not explicitly modelled. More concretely, it estimates whether the combination of the selected network parameters is sufficient enough to explain the observed network structure. Technically, the GOF analysis requires inclusion of all the parameters, both those that were included and those that were not included in the models. Following Hunter et al. (2008) recommendation, we simulated 1,000 samples over 100 million iterations to produce a high number of graphs from the fitted models and compare the characteristics of simulated graphs with the characteristics of the observed models. In order to assess whether a summary measure $S_k(x_{obs})$ for the observed graph is far from expected values under the fitted model, we calculated the standardized difference $[S_k(x_{obs}) - \bar{s}_k]/SD(S_k(x))$, where $\bar{s}_k$ and $SD(S_k(x))$ represent mean and standard deviation, respectively, which are calculated over the generated graphs (Lusher et al. 2013). Given that we estimated models based on 13 and 14 different parameters for which the estimation algorithm converged, we simulated networks from the models to generate distribution of graphs by including, in total, 54 network statistics.

According to the goodness of fit test, the summary of the corresponding feature in data is not extreme in the all distributions of graphs for each model. Building on criteria recommended by Wang et al. (2013), the results of our models demonstrate a good fit, as the GOF analysis for all network parameters included in the models demonstrated that *t*-values for the selected parameters were below the threshold of 0.1, and the values for all other parameters not included into the initial models were below 2.0 in their absolute values. In addition, we also measured standard deviation and skewness of the degree distributions for the entire model goodness of fit for each year. As a result, both of the measures were below 2. Particularly, standard deviations ranged between 0.7 and 1.4, whereas skewness ranged from 0.5 and 1.6, which suggests a good fit based on which we can assume that observed networks can be adequately reproduced based on the model estimations.

5. Discussion and Conclusion

Both recommendation and reputation represent valuable assets and important sources of auditor selection mechanisms (Davis & Robbins, 2004; Granovetter, 1973; Nelson, 1970; Podolny, 2001; Powell, 1990; Saxton, 1997; Johansen & Pettersson, 2013; Kacanski, 2017). In this study, we utilize a conceptual duality of demand mechanisms to investigate the dilemma of how the two selection

processes create an interplay in an auditor selection context. Taking a multilevel network approach to enable the integration of structural and attribute parameters specific to both theoretical arguments, our results show that both recommendation and reputation mechanisms simultaneously impact auditor selection processes.

The research was conducted based on the premise that social selection processes should be observed holistically (Robins, 2015), suggesting that, in order to comprehend the evolution of selection processes, it is imperative to integrate all variables that could be decisive in a particular research context (Granovetter, 1973) to observe both demand mechanisms (Powell, 1990; Saxton, 1997; Johansen & Pettersson, 2013; Kacanski, 2017). The network theory and ERGMs we used here (Wang et al., 2013; Lusher et al., 2013) enabled us to combine two theoretical paradigms, irrespective of variables, with the purpose of challenging their co-existence and identifying the interdependencies between the two demand logics (Davis & Robbins, 2004; Granovetter, 1973; Nelson, 1970; Podolny, 2001; Powell, 1990; Saxton, 1997; Johansen & Pettersson, 2013; Kacanski, 2017). This is because the theory of social network analysis and the concept of interdependency argue that social processes do not occur in a vacuum; multiple and various social activities and conditions influence corporate decisions (Robins, 2015). Additionally, to extend our knowledge and better understand multifaceted aspects of demand mechanisms, our study also makes use of the newly emerging field of multilevel network studies (Wang et al., 2018; Lazega et al., 2008).

Our findings correspond with Podolny's (2001) assumption that the recommendation mechanism serves as 'pipes' for spreading the information among closures in order to trigger selection and preferential attachment. We find that visibility and position of board members in the corporate board network plays an important role in terms of how board members are assembled. The development of corporate board networks gives us a clear indication that the structures of relations between individual supervisory board members within and across boards tend to develop by following the principle of proximity-to-auditor strategies (Baker, 1990; Uzzi & Lancaster, 2004; Courtney & Jubb, 2005). This is further proved by the finding that the network is characterized by a presence of those supervisory board members who are more popular than the others. That finding corresponds well with the assumption that the more knowledge and experience individuals have, the more sought-after they become to others (Bizjak, Lemmon, & Whitby, 2009; Bouwman, 2011; Chiu, Teoh, & Tian, 2009; Davis & Greve, 1997; Gulati & Westphal, 1999; Haunschild, 1993). Furthermore, we find that supervisory board members organize themselves in closures, which shows that board members organize themselves in a type of network configuration where ties tend to be formed between individuals who share common ties (Davis, 1970; Rank et al., 2010). This indicates that acknowledging that a focal individual with the necessary knowledge about experience goods is found to attract others who might be interested in gaining that knowledge (Beattie & Fearnley, 1998; Magri & Baldacchino, 2004).

With regard to the recommendation-based auditor selection process, we find that the presence of ties between boards of directors condition the engagement of audit partners. In particular, the choice of audit partner does not occur by random, but is strongly determined by the presence of board members on the same board. This finding is not unsurprising *per se* due to two assumptions integrated into this study. Firstly, because our network includes interlock ties, which makes the observation more complex as denser regions tend to appear at the top-level network, and secondly, because of the presence of more popular audit partners in the network.

Additionally, our findings are in alignment with the proposition that reputation plays a role in the auditor selection mechanism as well (Linthicum et al., 2010; Magri & Baldacchino, 2004; Kacanski, 2017). Similarly, reputation also drives the emergence of ties between clients and auditors (Magri & Baldacchino, 2004). A board's interest in engaging reputable auditors is possibly driven by its expectations to improve perceptions and awareness of their current and potential shareholders,

which could result in higher share values. Results show that supervisory boards tend to select auditors who are preferably affiliated with the Big Four rather than the non-Big Four. The results appear to show that interlocking directorships are not only driven by the same principle, but by combining the reputation effect with the auditor popularity effect, they have a strong influence on aligning corporate decisions across multiple boards. This may be also attributed to the effect of corporate strategies related to increasing proximity with desired auditors, which implies that sharing knowledge and experiences through cross-board ties causes assimilation in corporate decisions, where boards, in return, tend to engage reputable auditors rather than non-reputable ones. That argument supports the assumption that duality of demand mechanisms (recommendation and reputation) should not be understood from an exclusive point of view (Davis & Robbins, 2004; Granovetter, 1973; Nelson, 1970; Podolny, 2001; Powell, 1990; Saxton, 1997; Johansen & Pettersson, 2013; Kacanski, 2017). It is possible to argue for their co-existence in the mutuality of demand mechanisms, and they should be jointly observed. This is not only because part of any explanation might be missing if the alternative mechanism is excluded, but particularly because reputation nowadays seems to be recognized as one of the fundamental driving mechanisms in demand processes in the market for experience goods, and not only in the audit market (Brewer et al., 2002; Henrich & Gil-White, 2001). Lastly, none of the models showed deviations from the pattern found across the five years, indicating stable and consistent results, but also a reasonably good match of samples irrespective of the changes in the sampled companies across the models that resulted from the listing and delisting of business entities on the Nasdaq OMX Copenhagen.

To conclude, ties and configurations at one network level impact both the presence and absence of ties at other network levels, and as a result affect the overall system of interactions. Equally important, our study provides evidence that multilevel network patterns emerge in and across organizations based on the social mechanisms behind them. In this sense, we proposed that relational mechanisms, such as popularity spread within and across triadic closures that were identified in both the top-level and the meso-level network, could be utilized to better comprehend more complex network structures at different levels. The study intrinsically builds on previous research in accounting and auditing by combining organizational theory and methodology in order to intensify the significance of insights that in such a field could be contributive by emphasizing the relevance of network research. In this sense, our study is practically meaningful as it offers important implications for organizational design by considering corporate governance within and across organizational structures, along with collaborative engagements related to auditor selection processes.

By exploring the duality of demand-side mechanisms in an auditor selection context, we contribute to multilevel research on networks, accounting and auditing, and corporate governance. Particularly, we add to social network research on duality of demand mechanisms related to differentiation of experience goods, looking at service-oriented contexts. While there have been calls in the literature to analyze the cross-level generalizability of reputation (Beattie & Fearnley, 1998; Magri & Baldacchino, 2004), to the best of our knowledge there are no studies on this task that incorporate the alternative demand mechanism. Lastly, we add to the theory by examining competition between the two mechanisms by utilizing statistical models for social networks – exponential random graph models (Wang et al., 2018) – to open up the space for theoretical discussion on the interplay between two competitive processes.

This study has several limitations that should be considered in future research. First, though the choice of a single national context has some obvious limitations because it is difficult to extend conclusions to other contexts, such an approach was necessary as both data and analysis are sensitive to the institutional setting. Second, we were only able to capture auditor selection mechanisms at one point in time, so we could not discuss the process perspective involved in the change of selection mechanisms. This is because the temporal structure of our data necessitated that we concentrate on a

cross-sectional instead of a longitudinal dimension. However, this approach prevented us from identifying and incorporating information on the sequence of actions in relation to the development of interlocks and changes in board structures. Third, this study employs a straightforward binary value to categorize reputation and measure the presence of the effect in the network. This is due to the lack of official measurements were lacking for audit firms. Still, it is to be expected that, similarly to other industries, audit firms belonging to the Big Four network might also have different reputation scores, and therefore, could be observed with varying degrees of reputability. One such case likely happened in Denmark in 2014, when two Big Four audit firms decided to merge. Finally, this study does not take into account the sensitivity of demand mechanisms related to the audit fee effect and the willingness of clients to pay audit premiums to engage reputable auditors.

Future research should address those issues by exploiting the methodologies for capturing not only the reputation scores on a wider scale of business entities, including audit firms and individuals within audit firms, but audit fees as well. Also, it would be interesting to investigate a similar question in different corporate contexts and different regions in order to increase the generalizability of the study. Lastly, it would be appealing to explore a recent audit merger in Denmark between KPMG and Ernst & Young, and the implications of the merger for audit firm reputation.

Acknowledgments

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